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The results of these experiments can be summed up as follows: —

1. Certain fundamental vibrations of elliptical plates are not changed by wide variations in the ellipticity of the plates.
2. The vibrations of elliptical plates are less varied than those of circular plates. A small amount of ellipticity results in a quick and marked limitation in the variety of the vibrations of the plate.
3. It is to be conjectured, therefore, that an animal, whose ear is provided with an elliptical-shaped membrane, if such an animal exists, has less perfect powers of hearing than one provided with a circular membrane, as far as the variety of vibration of the membranes are considered.

No. XVIII. — PERFORATED VIBRATING DISCS.

BY FRANCIS E. CABOT.

Presented Dec. 10, 1879.

SINCE the membrane of the human ear is often perforated in auricular surgery without the destruction of the sense of hearing, at the suggestion of Professor Trowbridge I tried the effect of the removal of a large portion of the vibrating disc of a telephone. Three discs were made of ordinary tin-type plate; one with a hole in the centre half an inch in diameter; one with four holes, each half an inch in diameter, with their centres on two lines at right angles, crossing in the centre of the plate, and half-way from the centre to the edge of the disc; the third with four holes four fifths of an inch in diameter, and placed similarly to those last mentioned. Substituting these discs for the discs ordinarily used in a Bell telephone, I found that messages could be sent and received, but in a somewhat imperfect manner. On covering the holes with paper, I found that I could use either of the last two plates, in either the sending or receiving telephone, or in both, with nearly, if not quite, as good results as with the unperforated discs commonly used.

The disc with the hole in the centre did not give good results, as was to be expected, since the iron was taken away just in front of the magnet; but the others worked very well indeed. I also found that a disc of mica of the same size as the usual plate, with a piece of the ordinary plate, the size of a cent, fastened to its centre, could be used either as a receiving or sending disc over a short line; but it did not articulate very well; this defect, however, may have been caused by the want of homogeneity in the mica. The results of my experiments show that we can remove nearly one third of the iron plate (the whole plate being two inches and a half in diameter) without seriously injuring the articulation; and, furthermore, that a piece of iron three quarters of an inch in diameter is sufficient to cause a plate of mica two inches and a half in diameter to articulate partially and sufficiently to be heard over a short line.

No. XIX. — ON A STANDARD FOR ESTIMATING THE AMOUNT OF LIGHT REFLECTED BY VARIOUS SUBSTANCES.

By A. H. Lee.

Presented Dec. 10, 1879.

The following experiments were undertaken with the view of obtaining a standard reflecting surface, with which the light reflected from various reflecting surfaces could be compared. I have collected various experiments with white paper, tinted paper, and silvered surfaces.

At first I used the photometer due to Professor Pickering, and described in his work on *Physical Manipulations*, Vol. I. p. 132. L is a candle; α and β are two mirrors, which reflect the light of the candle to the Bunsen disc A, which slides between the mirrors α and β.

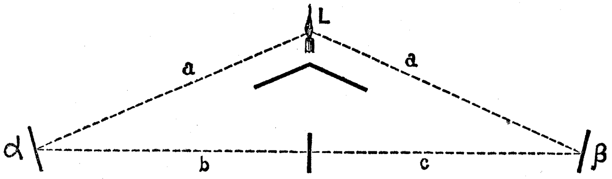

Fig. 1.

If I represents the reflection from mirror α, and I' that from β, we have at A

$$\frac{I}{(a+b)^2} = \frac{I'}{(a+c)^2}; \quad \text{or} \quad I = \frac{(a+b)^2}{(a+c)^2} I'.$$